Weekly Study Tip #2—Show your work

"Show your work" is code for "Explain to me how you came up with an answer."
Generally, the answer itself is very few points, so getting good at explanation is a key tool.

In chemistry, "show your work" generally refers to a relatively complex mathematical problem and these generally come in two types. (Sometimes you mix the two.)

Remember all "Final Answers" should have

1. Appropriate significant figures and units
2. A zero before the decimal if the value is a fraction and not in scientific notation
3. Scientific notation should be reported in the format "N x 10^x"
   Where N is a number between 1 and 10
   And you use an "x" not an "E" or "e" or "*" or "·" something else between the N and the 10.

Circling the answer is a good way to tell the instructor what to grade. While not required, if you don't circle it (or circle more than one thing) do not complain if you lose points because the instructor graded the wrong thing.

Type 1. Algebraic Equations.

These are problems solved by using some type of algebraic equation. Two examples from early in the class are density and the conversion between Celsius and Kelvin. For algebraic problems, do this

STEP	EXAMPLE
1—write the equation using standard variables *Note: there are no standard variables for density or mass, so use words*	density = mass/V
2—rewrite equation in same format Put appropriate numbers into the equation and include units and significant figures Make sure that the units of the numbers you input all match (*for example, if you were given mass in kg, change it to grams to match the mass unit in density before putting the number into the equation.)*	13.6 g/cm^3 = 123 g/V
3—do whatever rearranging you need to solve equation	(13.6 g/cm^3)V = 123 g V = 123 g/(13.6 g/cm^3) V = 9.04411
4—check your answer for appropriate significant figures and units	V = 9.04 cm^3
5—circle the answer you want graded	9.04 cm^3 = V

Type 2. Dimensional Analysis

These are even more common are often variations on unit conversions.

STEP	EXAMPLE
1—Identify starting point, where you want to wind up	given = 23.5 m
And any conversions given in the problem	want = time in minutes
You may want to note these, but it is not necessary.	Useful conversions: 1 hr ≡ 60 min
	100 cm = 1 m
1b—Remember that numbers with divided units are:	65 mph = 65 mi/hr
normally not your starting point, but a conversion factor	65 miles = 1 hr
rewriting as an equality in a mental trick to prevent bias for top or bottom	
2—Start on the left with what you are given	23.5 m
INCLUDE UNITS!	
Units are on top unless it is something like: "/m" or m^{-1}	
3—write the conversion factor, with units so units cancel	$23.5\ m\ x\ \frac{100\ cm}{1\ m}$
Remember to keep units and number of the equality together	

4—continue conversions until you get to the unit you want

$$23.5\ m\ x\ \frac{100\ cm}{1\ m}\ x\ \frac{1\ in}{2.54\ cm}\ x\ \frac{1\ ft}{12\ in}\ x\ \frac{1\ mi}{5280\ ft}\ x\ \frac{1\ hr}{65\ mi}\ x\ \frac{60\ min}{1\ hr} =$$

5—do the calculation

The easiest way (no need for parenthesis)

Ignore all values of "1", it doesn't change anything and more buttons are more potential error

Before each number on top press "X"

Before each number on the bottom press "÷"

Order does not matter

$$23.5\ m\ x\ \frac{100\ cm}{1\ m}\ x\ \frac{1\ in}{2.54\ cm}\ x\ \frac{1\ ft}{12\ in}\ x\ \frac{1\ mi}{5280\ ft}\ x\ \frac{1\ hr}{65\ mi}\ x\ \frac{60\ min}{1\ hr} = 0.13\ min$$

6—Check that your number has the correct significant figures and units

Remember that conversions between units in the same unit system are exact.

If a conversion is measured (as speed is in the given example),

we normally consider the "1" as exact and the other number as measured.

Do NOT assume that your "given" determines the final answer, it might not;

so check each conversion for significant figures.

Do NOT strike through the units to prove that they cancel.

You should be able to see if it cancels,

striking through means your instructor can't what you did.

7—Circle your final answer